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ECONOMIC ANALYSIS OF ALTERNATE HIGHWAY ROUTINGS OF INTERSTATE ROUTE NO. 90 IN THE VICINITY OF MISSOULA MONTANA

PREPARED BY

PLANNING SURVEY DIVISION
AND
INTERSTATE DIVISION
OF
MONTANA STATE HIGHWAY COMMISSION
IN COOPERATION WITH
U. S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

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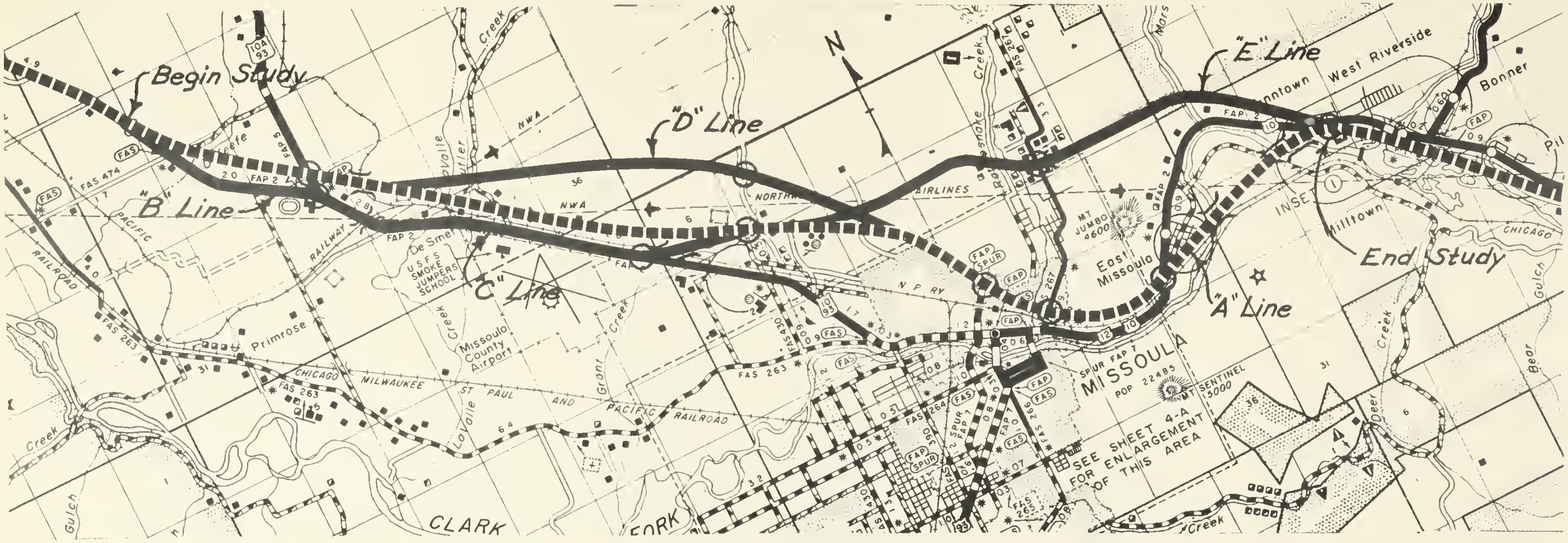
INTERSTATE ROUTE I-90

MISSOULA EAST & WEST

SITUATION MAP
of
ALTERNATE ROUTES



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ECONOMIC ANALYSIS OF ALTERNATE LOCATIONS FOR INTERSTATE ROUTE NO. 90 FROM A POINT EAST OF FRENCHTOWN VIA MISSOULA TO A POINT NEAR WEST RIVERSIDE

October 25, 1960

FOREWORD

An analysis of this type is prepared for the purpose of presenting known factual data concerning alternate highway routings and to compare the relative merits of the routes in relationship to economic factors involving construction costs, maintenance costs and vehicle operating costs as affected by traffic service.

Many, and often diverse, interests must be considered in determining the most favorable location for a new highway. These interests may be grouped into the following principal categories:

1. LAND OWNER. Persons owning or possessing land through which the highway might pass have a definite interest in its location. Farm land is very often affected adversely when a highway passes through it. This is especially true when the new highway divides the operations or when it requires the taking of irrigated or highly developed land. The effect on grazing land is generally of lesser magnitude; however, it many instances provision must be made for the passage of livestock from one side of the highway to the other.

The location of a highway through a residential area is naturally of considerable concern to the residence owner. There is an understandable reluctance on the part of an owner or renter to lose an established place of residence and attempt to find another suitable home elsewhere. In some instances, the highway might be located through a blighted area where the buildings would be of little value, and the purchase of this property for right-of-way purposes might be of benefit to both the property owner and the community in general.

The owner of vacant land in the general vicinity of an interchange is certainly benefited by the construction of a new highway. The new highway will create an opportunity for new commercial, industrial and residential developments which will enhance the value of the land in the area.

Although the land owner may be reluctant to relinquish land or property required for highway purposes, he will be compensated for the value of the property and any other damages involved. Federal housing legislation provides special terms for the replacement of residential property which is required for highway purposes.

2. COMMERCIAL FACILITIES. Many commercial facilities such as hotels, motels, service stations, eating places and others catering to highway traffic find that there is a definite relationship between the volume of business that they enjoy and the proximity of the establishment to a major highway. This effect is also felt in lesser degree by food stores, drug stores and other retail and service establishments which depend in part on business from highway traffic.

If these places are located in the line of the new highway and the

property is required for right-of-way purposes, the owners will be compensated in the same manner as any other property owner. If, however, the new highway is located considerable distance from the existing highway, or if the motorist finds it inconvenient to reach the establishment or community, it may be expected that there will be a substantial loss of business. Such potential loss is not compensable as is the case with property required for right-of-way purposes.

The investment in present commercial facilities may be protected by locating the new highway in close proximity to the community or city, by the judicious location of interchanges, and by restricting access to the new highway to interchange points.

3. HIGHWAY USER. The money for the construction and maintenance of State highways comes almost exclusively from taxes paid by the highway user. The Federal share of the construction money is derived from highway user taxes which are paid into the Federal Highway Trust Fund. The State's share of the money for construction and the entire cost of maintenance is paid out of the State Highway Fund which is composed almost entirely of highway-user taxes.

In addition to the taxes which the highway user pays for the construction and maintenance of highway facilities, consideration must also be granted to the cost to the highway user of operating his motor vehicle on these facilities. The route which has the lowest cost for construction and maintenance may be so located that it would provide the poorest service to the highway user. It is necessary, therefore, to consider the combined cost of construction, maintenance and vehicle operation in determining the most favorable route from the standpoint of the highway user. In most instances, the cost of vehicle operation on a section of highway is many times greater than the cost of constructing and maintaining this highway. For that reason, traffic service has an important bearing on the selection of highway routings.

Although this analysis attempts to evaluate numerous features pertaining to the alternate routes, the principal emphasis is placed on the evaluation of the routes from the standpoint of the highway user because of the transcending importance of the highway-user interest.

DESCRIPTION OF ROUTES

Aerial photographs, which are enclosed in this report, show the location of the various routings which have been evaluated in this analysis. Route A, which is shown as the dashed line, is considered as the basic route. Routes B, C, D, and E are proposed alternates to Route A that have been investigated because of certain beneficial features which might justify their selection over corresponding sections of Route A.

Routes B, C, and D involve alternate locations for the Interstate highway to the west of Missoula. Route E is an alternate location which would leave the basic route at a point near the west edge of Missoula, would follow a line to the north of the city on a bypass location, and would rejoin the basic route at a point near West Riverside.

Route A begins at Control Point A1-B1, which is the common western terminus for all routes at a point on the present highway about 4.5 miles east of Frenchtown. At this point, Route A leaves the line of the present highway and follows a southeasterly line directly to a point of interchange with U.S. Highway No. 93 about 0.2 mile north of the present junction of U.S. # 10 and U.S. # 93. This interchange is located at Control Point A2.

After leaving Control Point A2, Route A continues in a relatively direct line, a short distance north of and approximately parallel to the present highway, to Control Point A-6. This control point marks the location of a proposed interchange that will serve traffic to and from the west and this traffic will have an opportunity at this point to transfer between the Interstate highway and the present highway or other roads in this vicinity. FAS Route 430 (Reserve Street) will connect with this interchange.

Beyond Control Point A6, Route A is located on a line which veers to the north in order to miss the more highly developed portion of Missoula and the fringe areas. On this location, the Interstate highway will follow a line which is partially on and partially at the base of a bench which defines the north boundary of the developed portion of the city in this vicinity.

At Control Point A9, another interchange is proposed which will connect with the extension of Urlin Street. This will be an important point of interchange to and from the central portion of the city. Urlin Street is part of a spur to FAP Route 7.

East of Control Point A9, Route A follows along the bench on a line between the city water reservoir and the brewery. A short distance east of the reservoir, the proposed Interstate route descends into the valley of Rattlesnake Creek. This line will cross an older, but well developed, section of the city in this valley.

Another interchange will be located at Control Point A10, which marks the intersection of Route A and Van Buren Street. This will also be an important point of interchange to the city. It will be of special benefit to traffic to and from the east. Van Buren Street is located on FAS Route 267 which serves the Rattlesnake Creek valley.

Beyond Control Point A10, Route A will be located on a line between the railroad tracks and Mount Jumbo. This line will be followed to Control Point A11 where an interchange will be located to serve the community of East Missoula and the surrounding rural area.

From Control Point A11 to Control Point A12, the proposed route will be located on a direct line between East Missoula and the eastern terminus in the vicinity of West Riverside. On this line, two major bridges will be required to cross a loop of the Clark Fork River.

In general, Route A represents a generally direct line which will

provide the best service to Missoula, within the limitations imposed by terrain and construction conditions. The total length of the route is 15.9 miles, all of which will be four-lane construction.

Between Control Points A1 and A2, the route crosses a bench consisting of dry land farming. From Control Point A2 to A6, the proposed location crosses considerable amount of well developed farm land, both irrigated and non - irrigated. Some segregation of land will be involved here.

East of Control Point A6, the route crosses farm land; however, this also is an area of potential future commercial and industrial development. There is some concern that this route location, which bisects the area, will limit future development on the north side of the Interstate highway because it will restrict access to the railroad tracks.

In the vicinity of Control Point A9, the proposed line will involve the removal or demolition of several residences. Also, several residences will be affected in the location of the proposed line across the Rattlesnake Creek valley, including an historical mansion with a surrounding park.

Route A will involve the construction of 6 interchanges at Control Points A2, A6, A9, A10, A11 and A12. Railroad separations will be required near Control Point A3 and on the proposed extension of Reserve Street to connect with the Interstate highway near Control Point A6. Major bridges will be required for two crossings of the Clark Fork River between East Missoula and West Riverside.

Route B involves an alternate location to Route A between the west common terminus and the junction with U.S. # 93. The location of Route B was selected with the thought of constructing the Interstate highway through this area on a line which would follow quite closely the location of the present highway but preserving the present highway as a frontage road and connection to FAS Route 474 which serves a large pulp mill. This alternate location would increase the total length of the basic route to 16.1 miles or 0.2 mile more than the basic line as shown for Route A.

Route B would have the advantage that it would involve less land damage and segregation as compared with Route A.

Route C was selected as a line that would follow quite closely the location of the present highway from the western terminus to Control Point C4. The present highway will be used as a frontage road in some instances, and in others the Interstate highway will overlay the present highway, making it necessary to construct frontage roads to serve the local traffic. Route C would involve less land damage, but it would have the disadvantage of being located in close proximity to the airport with the possibility of conflict with glide paths. Route C would also be 0.3 miles longer than the basic route as shown for Route A.

Route D was included as an alternate route to the west of Missoula which would be located along the edge of the valley in grazing land or lower-grade

farm land, thereby avoiding the better farm land and potential commercial and industrial areas. It would also avoid most of the segregation of land that occurs on Route A. It would have the disadvantage that it would be about 0.2 miles longer than Route A, it would be necessary to construct a much longer connection to Reserve Street near Control Point A6, and the extra travel distance involved for traffic to and from the west would discourage the use of the Interstate highway through this area. Much of this traffic would find it more convenient to use the present highway for western movements.

The locations of interchanges and railroad separation structures will vary for Routes A, B, and D; however, the number of these facilities would be the same for all of these routes. Route C would require one extra railroad separation structure. All of these routes would also require the construction of the same two major bridges over the Clark Fork River between East Missoula and West Riverside.

Route E has been selected as an alternate to the basic line from Control Point A7-E7 to the eastern common terminus at Control Point A12-E9. By locating Route E through relatively undeveloped land some distance north of Missoula, it is possible to avoid most of the disruption of existing development which is associated with Route A. The location of Route E, however, involves serious construction and traffic service problems.

After leaving the basic line at Control Point A7-E7, Route E begins an ascent to a ridge marking the west boundary of the Rattlesnake Creek valley. By removing considerable material at the crest of the ridge, the crossing can be achieved with 5% grades on both sides of the ridge. After reaching the valley floor, Route E continues through developed farm land to the base of another ridge marking the east boundary of Rattlesnake Creek valley.

This ridge is a northward extension of Mount Jumbo and is higher and steeper than the west ridge. A deep cut at the top of the hill will permit the crossing of this ridge with 7% grades on both sides. On the east side of the ridge, a crossing of Marshall Creek must be made. This is a relatively deep canyon and will require either a high structure or deep fill including some kind of a separation structure over the road in this canyon.

After crossing Marshall Canyon, Route E reaches the valley floor in the vicinity of the present highway north of East Missoula and extends for a short distance to the common terminus at Control Point A12-E9.

Route E has the advantage that it avoids most of the developed area in the vicinity of Missoula, it would be 0.7 mile shorter than Route A and it would eliminate the need for the two bridges over the Clark Fork River. Disadvantages include the difficult and costly construction in crossing the two ridges and Marshall Creek, the increased vehicle operating costs in climbing the 5% and 7% grades, and the fact that the greater distance from the city of Missoula would restrict the usage of the route principally to through traffic without origin, destination or interest in East Missoula or Missoula and environs.

The traffic service feature will be reviewed more fully in the section

of this report pertaining to TRAFFIC SERVICE.

The following is a summary of the data pertaining to each of the alternate routes:

	A	B	C	D	E
Length in miles	15.9	16.1	16.2	16.1	15.2
No. of interchanges	6	6	6	6	4
No. of other highway separations	7	7	6	7	8
No. of railroad separations	2	2	3	2	2
No. of major bridges	2	2	2	2	0

Four-lane construction is planned for all routes.

TRAFFIC SERVICE

One of the most important considerations in a highway-user benefit analysis of this type is the assignment of traffic to the various alternate routes which have been proposed.

Regular traffic counts have been made for a number of years on the present highway through this area. These counts provide the necessary information concerning the amount of traffic involved in the assignment.

Special origin-destination surveys have also been made in the vicinity of Missoula to obtain information concerning the origins of trips, their destinations and the routings or desire lines involved.

On the basis of information obtained from these sources and an analysis of the distances and types of highways involved, it is possible to determine approximately what volume of traffic would use each of the proposed Interstate routes and what proportion of traffic would remain on the present highway or other roads and streets involved.

Traffic assignment in this analysis has been made on the basis of the following considerations:

1. For Routes A, B and C, there would be no measurable difference in the service to Interstate traffic other than a minor variation in travel distance. Since a four-lane highway will be required, access to the Interstate highway will be permitted only at interchange sites, and since the interchange sites are located in the same general areas for these three routes, it is assumed that there would be equal usage of the three routes.

2. The only important difference between Route D and Routes A, B and C

is the extra amount of travel distance involved via Route D (and the Reserve Street connection) between the U.S. # 93 interchange and the western part of Missoula and environs. The travel distance between these points via Route D is somewhat greater than the similar travel distance via the present highway. For this reason, it may be assumed that a certain proportion of the traffic between these points would find it preferable to use the present highway instead of Route D.

Experience in other states where freeway traffic has been analyzed reveals that there is a relationship between preferential usage of freeways and existing highways which is based on the travel time involved. The application of these findings to the situation involving Route D reveals that about 14% of the potential Interstate traffic would continue to use the present highway in preference to Route D. Under these conditions, Route D would carry 86% of the potential Interstate traffic, whereas Routes A, B and C would carry 100% of the potential Interstate traffic.

3. As previously mentioned, Route E has been selected as a bypass route on a relatively direct line from Control Point A6 on the west to Control Point A12-E9 at the east terminus. In order to miss the developed portion of Missoula and vicinity and to take advantage of natural terrain features, it has been necessary to locate the route considerable distance north of the city.

Being a more direct line between these points, the travel distance via Route E amounts to 7.2 miles as compared with 9.1 miles for the present highway. The savings in travel distance, combined with the beneficial features associated with the Interstate highway travel, would undoubtedly encourage the full usage of Route E by through passenger car trips.

Route E would be less attractive, however, for through trips on the part of heavy trucks. These trucks would have to ascend and descend the 5% and 7% grades over the two ridges bounding Rattlesnake Creek valley. This trip would involve considerable gear-shifting, braking, increased fuel consumption and loss of time. Under these conditions, it appears reasonable that some of these trucks would prefer to follow the water level grade via present routings through the city.

Route E would be of minor value to passenger cars and trucks with origins and destinations in Missoula and environs or on U.S. # 93 to the south of Missoula. In order for these trips to use Route E, it would be necessary to travel about 2.2 miles via low-standard oiled road on FAS Route 267 (Van Buren and Rattlesnake road) between Broadway and the interchange at Control Point E8. After reaching Route E at this interchange, additional travel of 3.5 miles would be involved to Control Point A12-E9 at the east terminus and 3.7 miles to Control Point A6 to the west.

This makes total travel of 5.7 miles to the east via Route E as compared with 5.3 miles via the present highway. Travel to the west via Route E would amount to 5.9 miles as compared with 3.8 miles via the present highway. This extra travel

involved for Route E trips to and from Missoula and environs would discourage its usage for such internal trips. This type of traffic would find it much more advantageous to follow the present highway in traveling to both the east and the west; therefore, only a small amount of trips of this type has been assigned to Route E.

The following Table No. 1 shows the average daily traffic under present conditions and the redistribution of this traffic under each of the Interstate routing proposals. It may be noted that under present conditions there is an average of 4,401 vehicles per day traveling over present highways that would be affected by any of the Interstate routings. This traffic moves 17.4 miles on present highways between the common termini at Control Points A1 and A12. The product of 4,401 vehicles per day (or 1,606,365 vehicles per year) times 17.4 miles of travel amounts to 27,950,751 vehicle-miles of travel per year under present conditions.

TABLE NO. 1

COMPARISON OF TRAVEL INVOLVED UNDER PRESENT CONDITIONS AND WITH ALTERNATE INTERSTATE ROUTES

	Average Daily Traffic	Travel Distance	Annual Vehicle-Miles of Travel
PRESENT CONDITIONS			
On present highway	4,401	17.4	27,950,751 - 100%
ROUTE A			
On Interstate highway	3,227	15.9	18,727,895 - 70%
On present highway or frontage roads	1,225	17.1	7,645,838 - 28%
On connecting roads	2,106	0.3	230,607 - 1%
On connecting streets	1,788	0.4	261,048 - 1%
Totals	8,346	33.7	26,865,388 - 100%
Average	2,184		
ROUTE B			
On Interstate highway	3,205	16.1	18,834,183 - 70%
On present highway or frontage roads	1,230	17.3	7,766,835 - 28%
On connecting roads	2,106	0.3	230,607 - 1%
On connecting streets	1,788	0.4	261,048 - 1%
Totals	8,329	34.1	27,092,673 - 100%
Average	2,177		

TABLE NO. 1
(continued)

	Average Daily Traffic	Travel Distance	Annual Vehicle-Miles of Travel
ROUTE C			
On Interstate highway	3,194	16.2	18,886,122 - 69%
On present highway or frontage roads	1,233	17.4	7,830,783 - 29%
On connecting roads	2,106	0.3	230,607 - 1%
On connecting streets	1,788	0.4	261,048 - 1%
Totals	8,321	34.3	27,208,560 - 100%
Average	2,173		
ROUTE D			
On Interstate highway	2,923	16.1	17,177,010 - 63%
On present highway or frontage roads	1,501	17.1	9,368,492 - 34%
On connecting roads	1,513	1.0	552,245 - 2%
On connecting streets	1,398	0.4	204,108 - 1%
Totals	7,335	34.6	27,301,855 - 100%
Average	2,162		
ROUTE E			
On Interstate highway	1,898	15.2	10,530,104 - 38%
On present highway or frontage roads	2,685	17.1	16,758,428 - 61%
On connecting roads	2,106	0.3	230,607 - 1%
On connecting streets	50	2.2	40,150 -
Totals	6,739	34.8	27,559,289 - 100%
Average	2,170		

Under the alternate Interstate routing proposals, this traffic will be split up among the Interstate highway, the present highway or replacement frontage roads, and the connecting roads and streets between the present highway and the Interstate highway. The proportion of the total traffic that would use each of the Interstate routes depends on travel distances, interchange locations, and the origins and destinations of the trips.

As illustrated in Table No. 1 under Route A, the redistributed traffic

would amount to an average of 2,184 vehicles per day, spread over a total of 33.7 miles of Interstate highway, the present highway or replacement frontage roads, and connecting roads and streets. The Interstate highway would serve 70% of the total travel, the present highway or replacement frontage roads would serve 28% of the total travel, and 2% of the total travel would be located on connecting roads.

For Route B, the same distribution of travel would occur as shown for Route A. For Route C, 69% of the total travel would be on the Interstate highway, 29% on the present highway or replacement frontage roads, and 2% on connecting roads and streets.

As the result of the more remote location and extra travel distances involved for Routes D and E, a lower proportion of the total travel would be carried on the Interstate highways for these routes. Route D would involve 63% of the total travel on the Interstate highway, 34% on the present highway or replacement frontage roads, and 3% on connecting roads and streets. Route E would involve 38% of the total travel on the Interstate highway, 61% on the present highway or replacement frontage roads, and 1% on connecting roads.

It may also be noted from this table that all of the alternate Interstate routes would improve the traffic service over present conditions in that less overall travel would be required with the new routings to meet the same highway transportation objectives.

VEHICLE OPERATING COSTS

It has been well established that motor vehicle operating costs vary among different types of highways and under diverse operating conditions, ranging from lowest operating costs on high-standard facilities such as the Interstate system to highest operating costs on very low-standard roads or congested city streets.

A publication of the American Association of State Highway Officials contains suggested operating costs for motor vehicles using principal types of highways. These suggested costs have been adapted in this analysis to motor fuel and other costs applying in Montana, and appropriate adjustments have been made to conform to the conditions prevailing in the vicinity of Missoula.

These adjustments of the AASHO figures have produced the following unit vehicle operating costs for use in this analysis:

TYPE OF FACILITY	OPERATING COSTS PER VEHICLE-MILE	
	PASSENGER CARS	TRUCKS
Rural Interstate - normal terrain	$.0964	$.3081
Rural Interstate - 5% to 7% grades	$.1023	$.3680
Urban Interstate	$.0923	$.2954
Rural Primary	$.1093	$.3498
Urban Primary	$.1397	$.4470
Connecting Roads	$.1093	$.3498
Connecting Streets	$.1397	$.4470

The enclosed Table No. 2 presents a summary of the total vehicle-miles of travel on each type of highway facility for each of the alternate routes and the corresponding vehicle operating costs as computed on the basis of the foregoing unit values.

It may be noted from this table that Route A would provide the most favorable solution to the highway transportation situation insofar as the total amount of travel and total operating costs are concerned. This advantage occurs because of a combination of factors; however, the principal contributing features are described below:

1. In comparison with Route B, Route A would involve 0.2 mile less travel distance for traffic using the Interstate highway. For traffic which turns north on U.S. 93, west of Missoula, Route A would also save 0.2 mile in travel distance between the interchange for Route A at Control Point A2 and the interchange for Route B at Control Point B3.

2. The same advantages would occur in comparison of Route A with Route C with the exception that the savings in travel distance would be increased to 0.3 mile for both types of traffic.

3. The travel distance for Interstate highway traffic on Route A would also be 0.2 mile less than for Route D. The travel distance via the Reserve Street connection between the present highway and the Interstate highway would also be 0.7 mile less for Route A than it would be for Route D. This feature would increase the overall travel distance for traffic using the Interstate highway under Route D and at the same time, it would assign a greater proportion of the total traffic to usage of the present highway where unit operating costs would be higher than those of the Interstate highway.

HICI PER G C
UNDER ALTERNATE INTERSTATE ROUTING PROPOSALS

ROUTING AND TYPE OF FACILITY	PASSENGER CARS		TRUCKS		ALL VEHICLES	
	ANNUAL VM OF TRAVEL	ANNUAL COST	ANNUAL VM OF TRAVEL	ANNUAL COST	ANNUAL VM OF TRAVEL	ANNUAL COST
PRESENT CONDITIONS:						
Primary highway	24,317,153	$2,890,081	3,633,598	$1,381,977	27,950,751	$4,272,058
ROUTE A:						
Interstate highway	16,293,269	$1,557,372	2,434,626	$ 743,953	18,727,895	$2,301,325
Primary highway	6,651,879	863,013	993,959	412,766	7,645,838	1,275,779
Connecting roads and streets	427,739	53,654	63,916	25,655	491,655	79,309
TOTAL	23,372,887	$2,474,039	3,492,501	$1,182,374	26,865,388	$3,656,413
ROUTE B:						
Interstate highway	16,385,739	$1,566,286	2,448,444	$ 748,210	18,834,183	$2,314,496
Primary highway	6,757,147	874,530	1,009,688	418,273	7,766,835	1,292,803
Connecting roads and streets	427,739	53,654	63,916	25,655	491,655	79,309
TOTAL	23,570,625	$2,494,470	3,522,048	$1,192,138	27,092,673	$3,686,608
ROUTE C:						
Interstate highway	16,430,927	$1,570,643	2,455,195	$ 750,290	18,886,122	$2,320,933
Primary highway	6,812,782	880,674	1,018,001	421,212	7,830,783	1,301,886
Connecting roads and streets	427,739	53,654	63,916	25,655	491,655	79,309
TOTAL	23,671,448	$2,504,971	3,537,112	$1,197,157	27,208,560	$3,702,128
ROUTE D:						
Interstate highway	14,943,999	$1,428,171	2,233,011	$ 682,238	17,177,010	$2,110,409
Primary highway	8,150,588	1,040,322	1,217,904	497,430	9,368,492	1,537,752
Connecting roads and streets	658,027	77,319	98,326	36,974	756,353	114,293
TOTAL	23,752,614	$2,545,812	3,549,241	$1,216,642	27,301,855	$3,762,454
ROUTE E:						
Interstate highway	9,477,095	$ 925,175	1,053,009	$ 337,499	10,530,104	$1,262,674
Primary highway	14,244,664	1,747,856	2,513,764	987,036	16,758,428	2,734,892
Connecting roads and streets	230,144	26,192	40,613	14,792	270,757	40,984
TOTAL	23,951,903	$2,699,223	3,607,386	$1,339,327	27,559,289	$4,038,550

4. For traffic using the Interstate highway, the travel distance via Route E would be 0.7 mile less than the distance via Route A; however, only a relatively small proportion of the total traffic would enjoy this advantage under Route E. The great majority of the traffic would continue to use the present highway in preference to Route E, and in doing so, higher unit operating costs would be involved on present facilities. The distance savings for Interstate highway traffic on Route E would be more than offset by the extra cost to non-Interstate traffic operating on existing facilities.

From the standpoint of traffic service and vehicle operating costs, Route A would be the preferred location of the Interstate System highway, with Routes B, C, D and E following in that order.

COST OF TRAFFIC STOPS

The foregoing unit vehicle operating costs do not include any allowance for stops and starts such as are encountered on busy city thoroughfares. The cost of such stops are of considerable importance in urban areas and with traffic volumes using the present highway through Missoula.

In order to appraise the effect of stops and starts, special trial runs were made through the city of Missoula along the present highway from a point near the east city limits to another point near Reserve Street in the area to the west of the city. The results of these runs showed that there was an average of 1.75 stops per trip with an average of 17 seconds delay for each stop. Stops were caused by five traffic signals along the route, school crossings, parking of vehicles and similar restrictions.

Established figures place the cost of these stops at $.0150 each for passenger cars or $.0263 per trip through the city. Similar stops for trucks amount to $.0842 per trip through the city.

Traffic assignment figures show that there is an average of 2,508,384 trips per year through the city by passenger cars and trucks which would be affected by the alternate Interstate highway locations. The cost of these stops would amount to $84,851 per year for present traffic using the present highway.

The amount of traffic remaining on the present highway through the city under Interstate routing proposals A, B, C, and D would amount to 1,469,177 trips per year, or an annual cost of $49,698.

Since the location of Route E would serve a smaller proportion of the total traffic, the traffic remaining on the present highway through the city would be greater than the amounts for Routes A, B, C, and D. With Route E, there would be 2,111,055 trips per year through the city subject to the cost of these stops. The annual cost of these stops would be $73,856 for this route.

CONSTRUCTION COSTS

The estimated cost of constructing the Interstate highway facilities and related connecting and frontage roads are shown in tables in the latter part of this report. These costs are segregated into the principal categories involved in highway construction.

Since different components of the highway have different service lives, it is necessary to divide the total costs shown by the average years of life expectancy in order to arrive at an annual cost for direct comparison purposes.

The following Table No. 3 shows a comparison of the total cost and the annual cost for each of the alternate route:

Table No. 3
CONVERSION OF TOTAL CONSTRUCTION COSTS
TO ANNUAL CONSTRUCTION COSTS

		ROUTE A		ROUTE B	
CONSTRUCTION ITEMS	YEARS OF LIFE	TOTAL COST	ANNUAL COST	TOTAL COST	ANNUAL COST
Grading, drainage and utility adjustments	40	$1,958,000	$ 48,950	$1,955,000	$ 48,875
Surface, base and traffic services	20	3,523,000	176,150	3,555,000	177,750
Structures	50	3,280,000	65,600	3,280,000	65,600
Right-of-way	50	2,708,000	54,160	2,676,000	53,520
Miscellaneous	30	40,000	1,333	40,000	1,333
Engineering	40	1,303,000	32,575	1,307,000	32,675
TOTAL		$12,812,000	$378,768	$12,813,000	$379,753

		ROUTE C		ROUTE D	
CONSTRUCTION ITEMS	YEARS OF LIFE	TOTAL COST	ANNUAL COST	TOTAL COST	ANNUAL COST
Grading, drainage and utility adjustments	40	$1,749,000	$ 43,725	$1,847,000	$ 46,175
Surface, base and traffic services	20	3,644,000	182,200	3,599,000	179,950
Structures	50	3,047,000	60,940	3,326,000	66,520
Right-of-way	50	2,977,000	59,540	2,541,000	50,820
Miscellaneous	30	40,000	1,333	40,000	1,333
Engineering	40	1,254,000	31,350	1,306,000	32,650
TOTAL		$12,711,000	$379,088	$12,659,000	$377,448

		ROUTE D-1		ROUTE E	
CONSTRUCTION ITEMS	YEARS OF LIFE	TOTAL COST	ANNUAL COST	TOTAL COST	ANNUAL COST
Grading, drainage and utility adjustments	40	$1,832,000	$ 45,800	$7,477,000	$186,925
Surface, base and traffic services	20	3,589,000	179,450	3,296,000	164,800
Structures	50	2,546,000	50,920	2,056,000	41,120
Right-of-way	50	2,541,000	50,820	886,000	17,720
Miscellaneous	30	40,000	1,333	40,000	1,333
Engineering	40	1,186,000	29,650	1,905,000	47,625
TOTAL		$11,734,000	$357,973	$15,660,000	$459,523

It has previously been explained that the location of Route D would involve a proposed connecting road between the present highway and Route D in the vicinity of Reserve Street in order to permit the exchange of traffic between these two highways.

An alternate proposal has been investigated which involves the elimination of this connecting road, thereby reducing construction costs but at the same time reducing some of the traffic service benefits. The net construction costs, omitting

the connecting road, are shown in the foregoing tables under Route D-1. It may be noted that the annual construction costs under Route D-1 would be $19,475 less than the corresponding costs for Route D.

The foregoing tables show that, from the standpoint of both total and annual construction costs, Route D-1 would involve the lowest cost, followed by Routes D, C, A, B and E in that order.

MAINTENANCE COSTS

The annual cost of maintenance must be added to the annual amortized cost of construction in order to arrive at the overall annual cost of providing and maintaining the necessary highway facilities.

It is customary to consider the maintenance costs for both the new Interstate System mileage and the existing highway facilities which will not be replaced by the new Interstate construction. In this analysis, however, it is evident that it will be necessary to maintain the same amount of existing mileage regardless of the Interstate routing selected.

Routes A, B, D, and E are all located on new alignment, and they will not replace any of the present highway. Route C will overlay a portion of the present highway west of Missoula; however, in this event, it will be necessary to construct an equivalent amount of frontage road to serve local traffic which cannot use the Interstate highway. Since this equivalent amount of frontage road must also be maintained, there will be no change in the overall amount of mileage to be maintained.

Since the mileage of existing highway to be maintained is the same for all routes, these costs are being omitted from the analysis in the interest of simplicity. The maintenance costs to be considered include those for the Interstate highway, the new connection to Reserve Street and the small amount of frontage road east of Control Point A6 which must be constructed and maintained to serve traffic cut off by the Interstate highway.

The total annual cost of maintenance for each of the alternate routes is shown below:

ROUTE A

15.9 miles of Interstate highway at $2,500 per mile	$39,750
0.3 mile of Reserve Street connection at $1,000 per mile	300
1.4 miles of frontage road at $1,000 per mile	1,400
TOTAL	$41,450

ROUTE B

16.1 miles of Interstate highway at $2,500 per mile	$40,250
0.3 mile of Reserve Street connection at $1,000 per mile	300
1.4 miles of frontage road at $1,000 per mile	1,400
TOTAL	$41,950

ROUTE C

16.2 miles of Interstate highway at $2,500 per mile	$40,500
1.4 miles of frontage road at $1,000 per mile	1,400
TOTAL	$41,900

ROUTE D

16.1 miles of Interstate highway at $2,500 per mile	$40,250
1.0 mile of Reserve Street connection at $1,000 per mile	1,000
TOTAL	$41,250

ROUTE D-1

16.1 miles of Interstate highway at $2,500 per mile	$40,250

ROUTE E

15.2 miles of Interstate highway at $2,500 per mile	$38,000
0.3 mile of Reserve Street connection at $1,000 per mile	300
0.6 mile of frontage road at $1,000 per mile	600
TOTAL	$38,900

It is possible that sanding and snow removal on about 5 miles of 5% and 7% grades on Route E would place the maintenance cost of this route above the average for the other routes; however, this extra maintenance cost would be offset to some extent by lower maintenance costs as the result of lower traffic volumes and the fact that there would be no maintenance cost for the two bridges over the Clark Fork River which would apply to the other routes. For practical purposes, it is assumed that the flat rate of $2,500 per mile for maintaining Interstate highways would apply to all routes.

SUMMARY

The enclosed Table No. 4 presents a comparison of the annual costs for construction, maintenance and vehicle operation as they pertain to each of the proposed Interstate highway routings.

From this table, it may be noted that Route D-1 has the lowest annual cost for construction and maintenance and that Route E has the highest annual cost in this respect. From the standpoint of overall vehicle operating costs, Route A has the most favorable rating and Route E has the least favorable rating. When all of these costs are combined, Route A has the most favorable rating and Route E has the least favorable routing.

The recommended procedure for comparing the relative merits of each route involves the analysis of each route with respect to its benefit/cost ratio. Under

COMPARISON OF ANNUAL CONSTRUCTION, MAINTENANCE AND VEHICLE OPERATING COSTS FOR EACH OF THE ALTERNATE INTERSTATE HIGHWAY ROUTINGS

COST SECTION:

	ROUTE A	ROUTE B	ROUTE C	ROUTE D	ROUTE D-1	ROUTE E
Annual construction costs	$ 378,768	$ 379,753	$ 379,088	$ 377,448	$ 357,973	$ 459,523
Annual maintenance costs	41,450	41,950	41,900	41,250	40,250	38,900
Subtotal	$ 420,218	$ 421,703	$ 420,988	$ 418,698	$ 398,223	$ 498,423
Ratio	1.0552	1.0590	1.0572	1.0514	1.0000	1.2516
Annual operating costs	$3,656,413	$3,686,608	$3,702,128	$3,762,454	$3,774,131	$4,038,550
Annual cost of stops	49,698	49,698	49,698	49,698	49,698	73,856
Subtotal	$3,706,111	$3,736,306	$3,751,826	$3,812,152	$3,823,829	$4,112,406
Ratio	1.0000	1.0081	1.0123	1.0286	1.0318	1.1096
GRAND TOTAL OF ALL COSTS	$4,126,329	$4,158,009	$4,172,814	$4,230,850	$4,222,052	$4,610,829
Ratio	1.0000	1.0077	1.0113	1.0253	1.0232	1.1174

BENEFIT COST SECTION:

Benefits equal present cost of vehicle operation and stops minus same costs under new conditions.

	ROUTE A	ROUTE B	ROUTE C	ROUTE D	ROUTE D-1	ROUTE E
Present conditions	$4,356,552	$4,356,552	$4,356,552	$4,356,552	$4,356,552	$4,356,552
Minus new conditions	-3,706,111	-3,736,306	-3,751,826	-3,812,152	-3,823,829	-4,112,406
Benefits	$ 650,441	$ 620,246	$ 604,726	$ 544,400	$ 532,723	$ 244,146
BENEFITS	$ 650,441	$ 620,246	$ 604,726	$ 544,400	$ 532,723	$ 244,146
COSTS	$ 420,218	$ 421,703	$ 420,988	$ 418,698	$ 398,223	$ 498,423
Ratio	1.5479	1.4708	1.4364	1.3002	1.3378	0.4898
Priority Rating	1	2	3	5	4	6

this procedure, the value of annual benefits which traffic will enjoy as the result of the new highway construction on each route is compared with the corresponding costs of providing these benefits as reflected in annual construction and maintenance costs. Table No. 4 shows the results of these computations as summarized in the benefit/cost ratios at the bottom of the table.

These benefit/cost ratios range from 1.5479 for Route A down to 0.4898 for Route E. In simpler terms, these ratios show that each $1.00 invested in the construction and maintenance of the new highway facilities will save the highway user $1.55 for Route A, $1.47 for Route B, $1.44 for Route C, $1.30 for Route D and $1.34 for Route D-1. Route E has a negative benefit/cost ratio in that $1.00 expended for construction and maintenance of this route will produce savings of only $0.49, which is an insolvent condition.

These ratios are computed on the basis of present traffic volumes. It may be expected that traffic volumes will double as an average during the expected life of the new highway facilities, and consequently the benefits may be expected to also double, thereby producing benefit cost ratios equal to twice the values shown in Table No. 4.

CONCLUSIONS

This analysis shows that Route A has the lowest overall cost for construction, maintenance and vehicle operation. Since the highway user pays for all of these costs, this route would be most favorable from the standpoint of the highway user. The benefit/cost ratio for Route A also shows that Route A has the most favorable relationship between the costs of construction and maintenance and the returns in the form of benefits to the highway user.

On the basis of these findings, it must be concluded that this highway-user benefit analysis supports Route A as the most favorable location for the new Interstate highway.

There are other features which should be considered in conjunction with the highway-user benefit analysis, and since most of these features were discussed at a public hearing at Missoula in connection with this matter, a summary of the public hearing testimony is enclosed as a part of this report.

PUBLIC HEARING SUMMARY

A public hearing was held in Missoula on May 16, 1960 for the purpose of discussing alternate locations for the Interstate highway in the vicinity of Missoula and between the common termini as defined in this report.

At the time of the hearing, extensive preliminary investigations had been made of several alternate locations for the new highway; however, Routes A and E were presented at the hearing as being the principal basic routes. It was recognized at the hearing that justification existed for further investigation of possible

alternate locations for the highway west of Missoula.

The preliminary investigations had proceeded to the point that engineering problems and construction features were described for the basic routes. At this stage, however, construction costs had not been developed for the alternate routes and the right-of-way acquisition costs were not known.

Traffic service features were also discussed in a general manner as derived from traffic counts and origin-destination surveys which had been made in the vicinity of Missoula. A full-scale traffic analysis and assignment had not been made at this stage.

Reference should be made to the transcript of this hearing for a full report of the testimony presented concerning these routes; however, it is considered desirable to include in this report a brief summary of the proceedings as a supplement to the highway-user benefit analysis.

After department personnel had concluded their discussion of the features pertaining to each route, the Chairman of the Streets and Highways Division of the Missoula Chamber of Commerce presented a written report on the recommendations of that group in connection with the location of the new highway. This report supported the location of Route A from the east terminus near West Riverside to the proposed Urlin Street interchange at Control Point A9. Westward from this point, support was given to the "hillside route" which is approximately the alignment of Route D as described in this analysis.

The hillside route was recommended as skirting the flat land to the west of Missoula which would be the logical location for future industrial development in this vicinity. The report opposed the locations as described for Routes A and C west of Missoula and Route E which would bypass the city on the northside location. It urged the construction of all interchanges as proposed for service to the city of Missoula and environs.

Following this report, a written statement was presented by a part-owner of a 485 acre ranch to the west of Missoula through which the Interstate highway would pass. This ranch included part of the flat land which had been described as the site for potential industrial development. The proposed basic alignment for Route A would bisect this land, and it was suggested that consideration be given to the alternate route which would follow along the hillside.

An attorney then spoke on behalf of the family that owned an historical mansion and park near Rattlesnake Creek. The proposed location for Route A would involve the acquisition of this property for right-of-way purposes. This spokesman stated that it was his opinion that Route E, or the proposed bypass route, would be most desirable because of shorter length, fewer interchanges, less disruption of existing development, the elimination of the need for two bridges over the Clark Fork River as required for the other basic route, and the much lower right-of-way cost which would more than offset any extra construction cost on the bypass route. It was his belief that the final development of construction

and right-of-way costs would support the bypass location as shown for Route E.

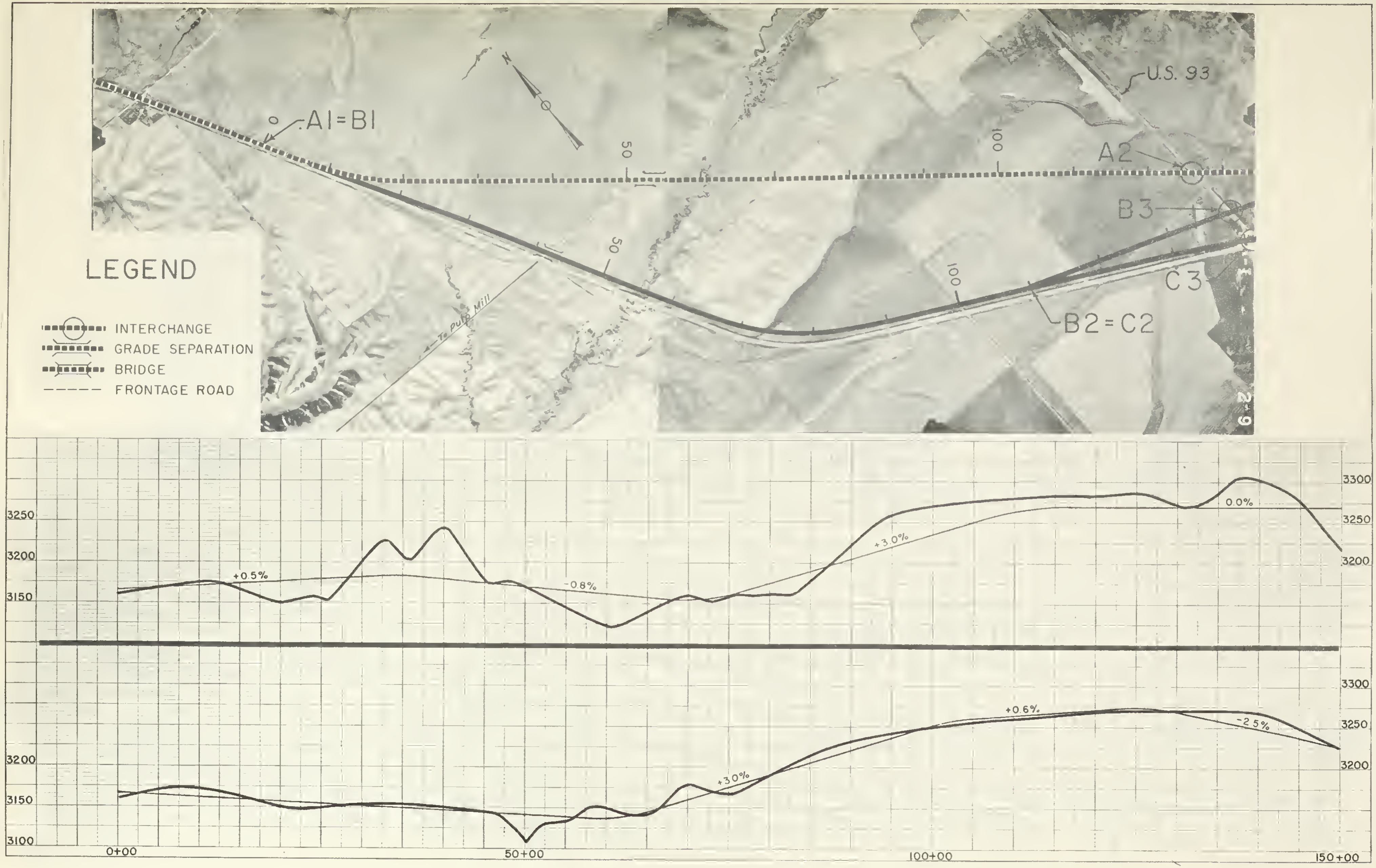
Another person owning property in the line of the proposed Interstate highway spoke on behalf of the basic line as shown for Route A in the vicinity of Missoula. It was his opinion that this route would provide the best service to Missoula and vicinity. It was his suggestion, however, that the line to the west of the city should follow the hillside location.

Another person spoke on behalf of a hospital in the vicinity of Urlin Street. He pointed out that proposed location of the interchange on Route A at Urlin Street would route a large amount of traffic into the city past this hospital. This would create an undesirable situation from the standpoint of the hospital.

At the close of the hearing, a petition was presented bearing 555 names and supporting a route which was described as follows:

> "Starting where the present U.S. Highway No. 10 intersects West Broadway, and from this point acquire right-of-way through Milwaukee Railroad land, using the Milwaukee Railroad right-of-way, to a point 5 miles East of Missoula where the railroads are adjacent to each other."

As explained, this public hearing testimony is presented as supplementary information which is not a part of the highway-user benefit analysis but which is worthy of consideration in the final determination of the most appropriate location for the new Interstate highway.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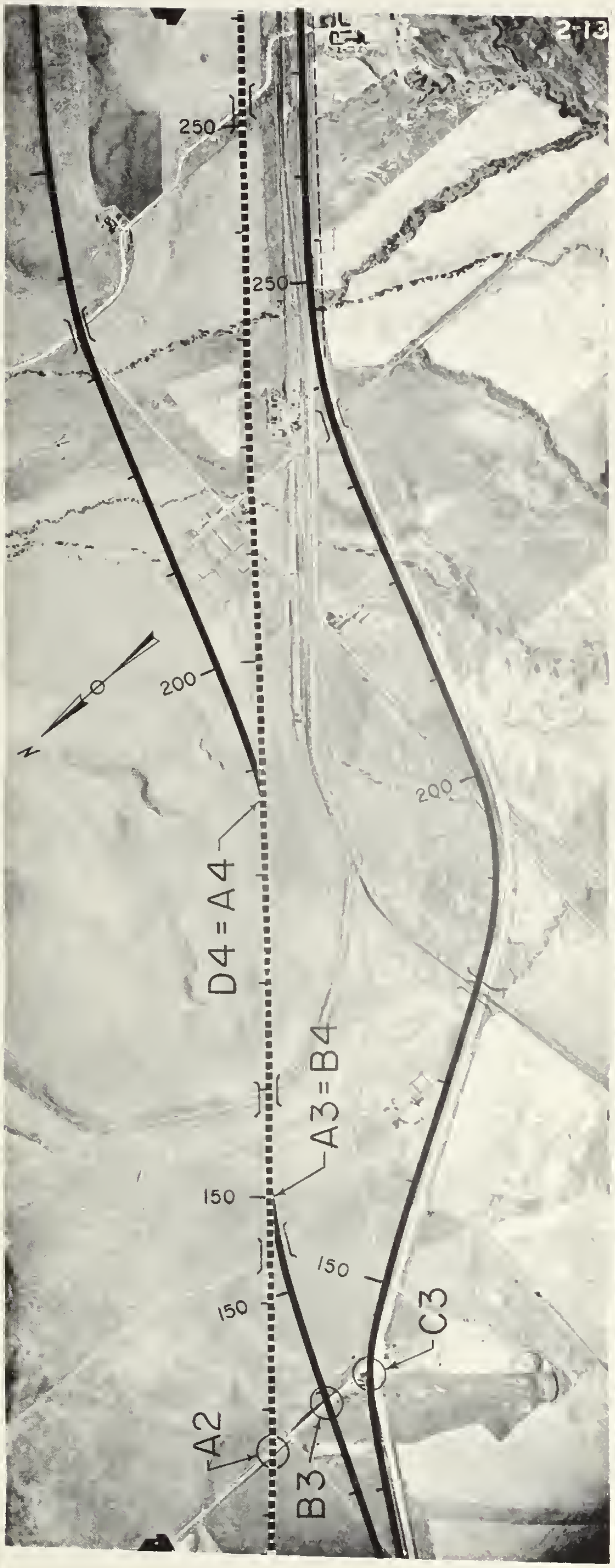
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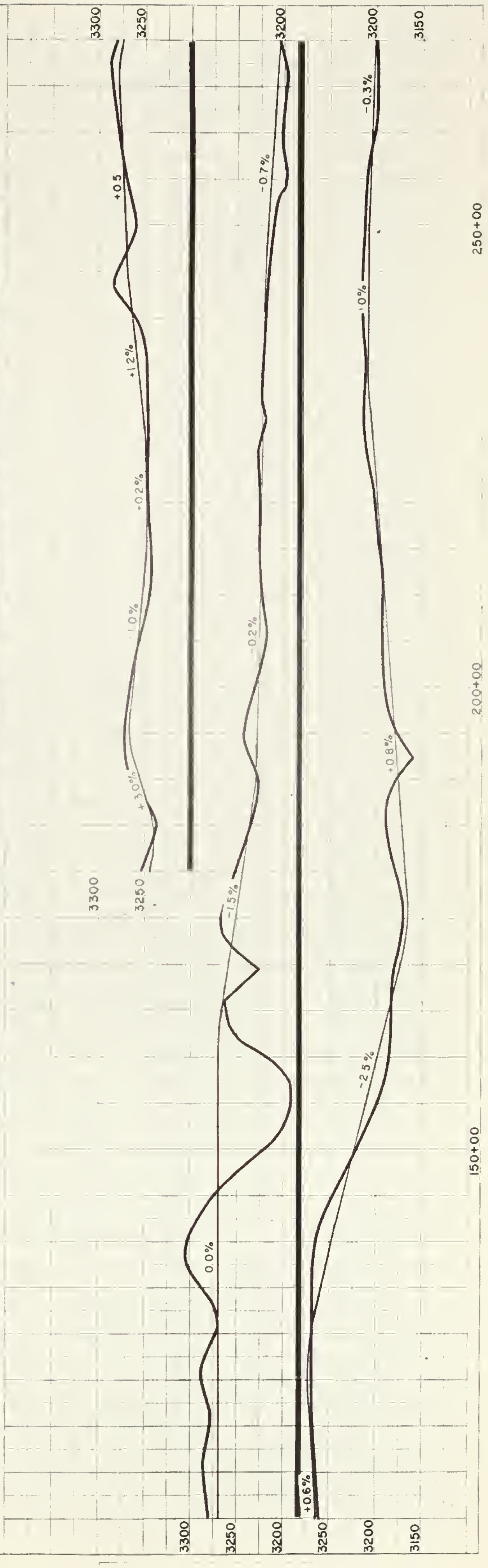
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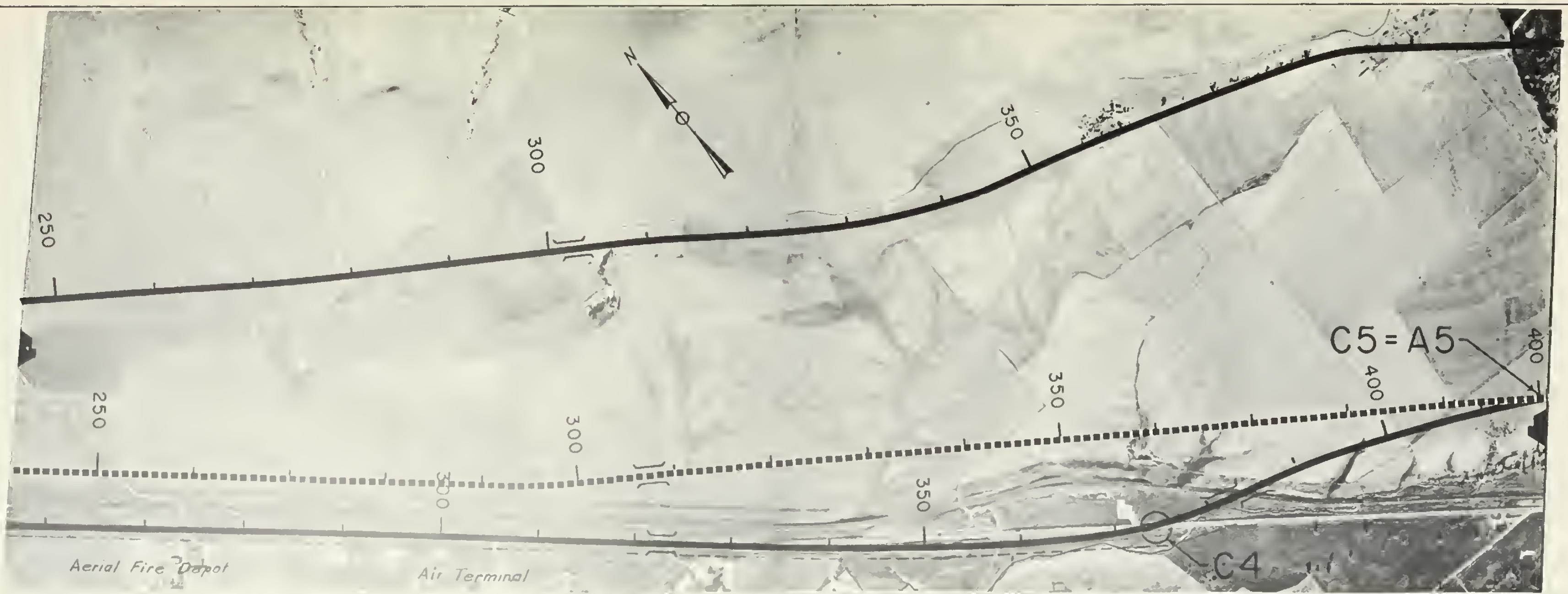

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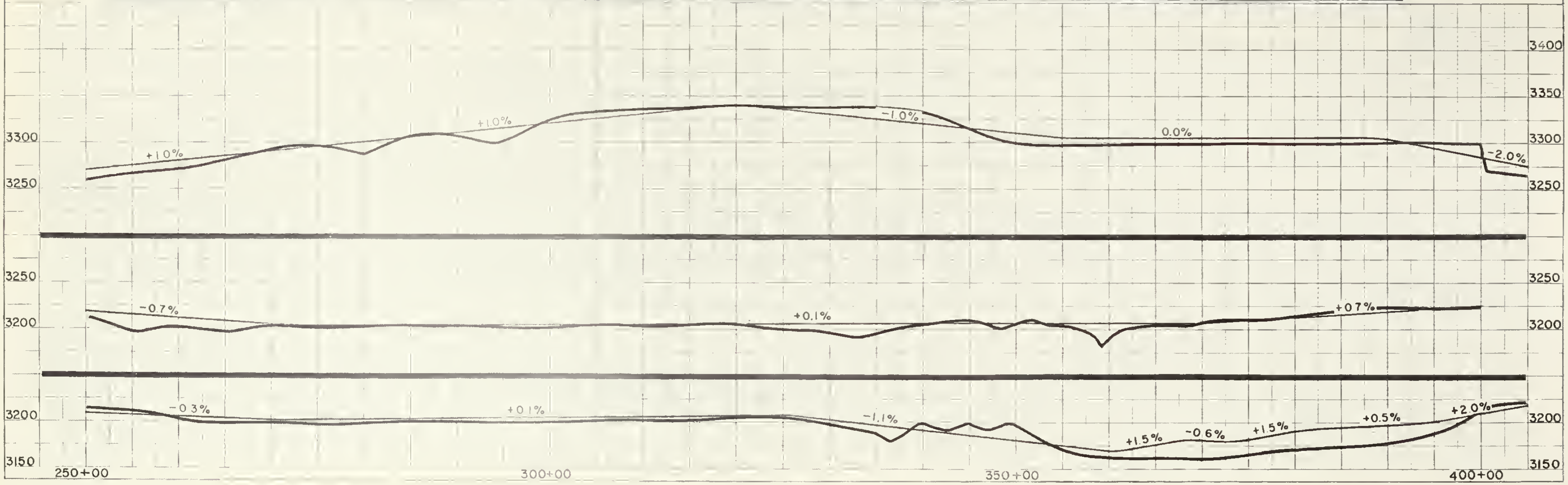

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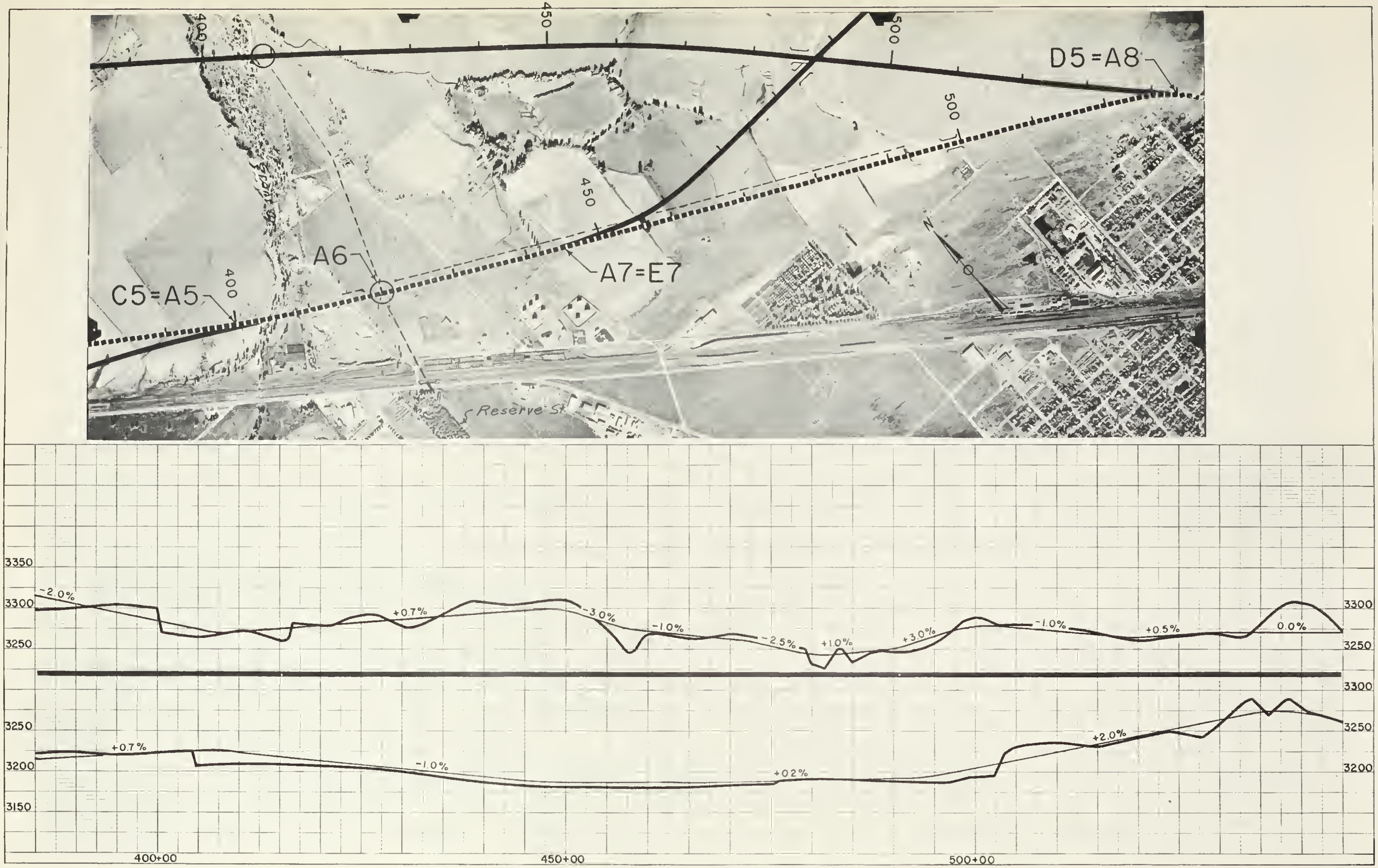
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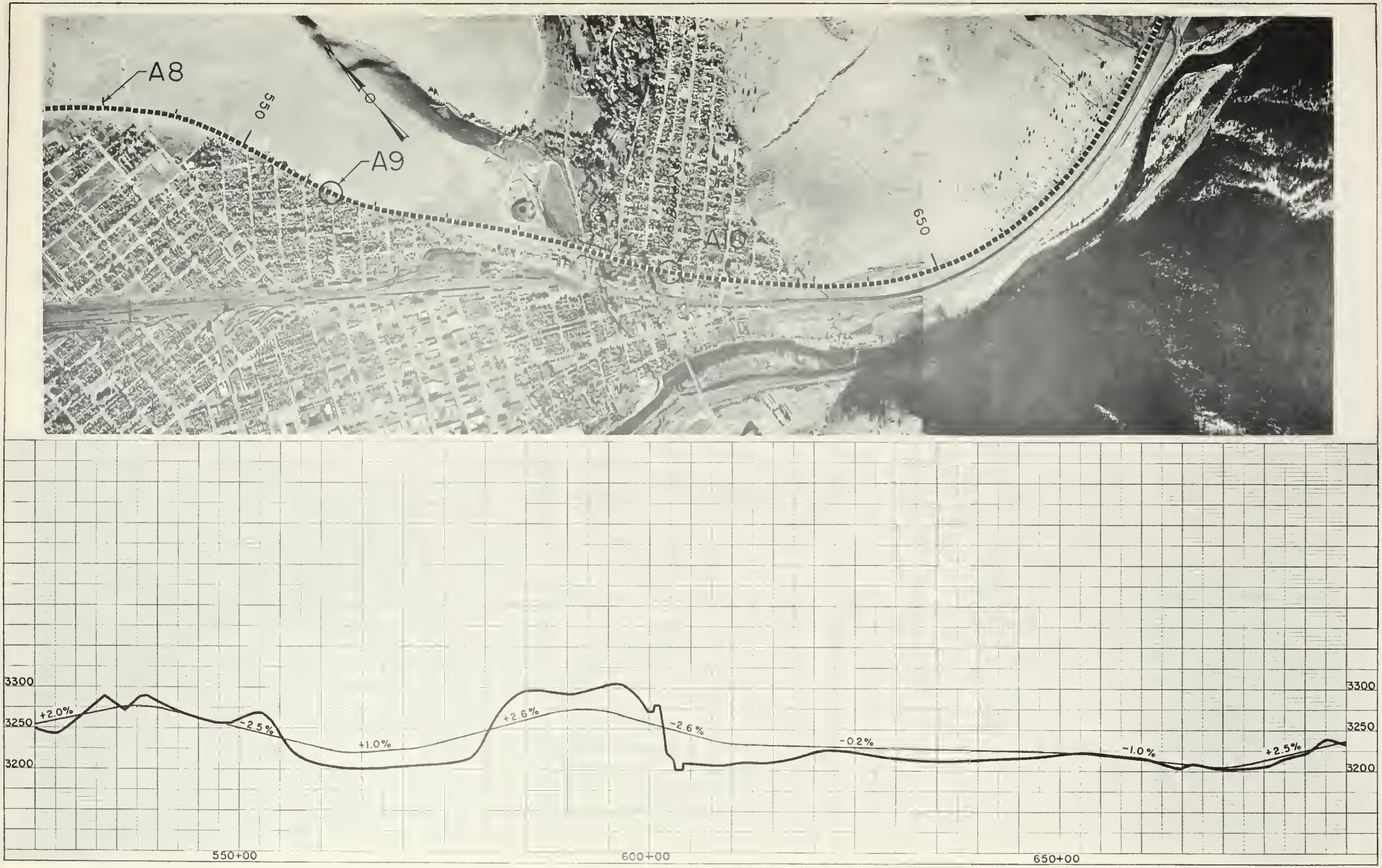
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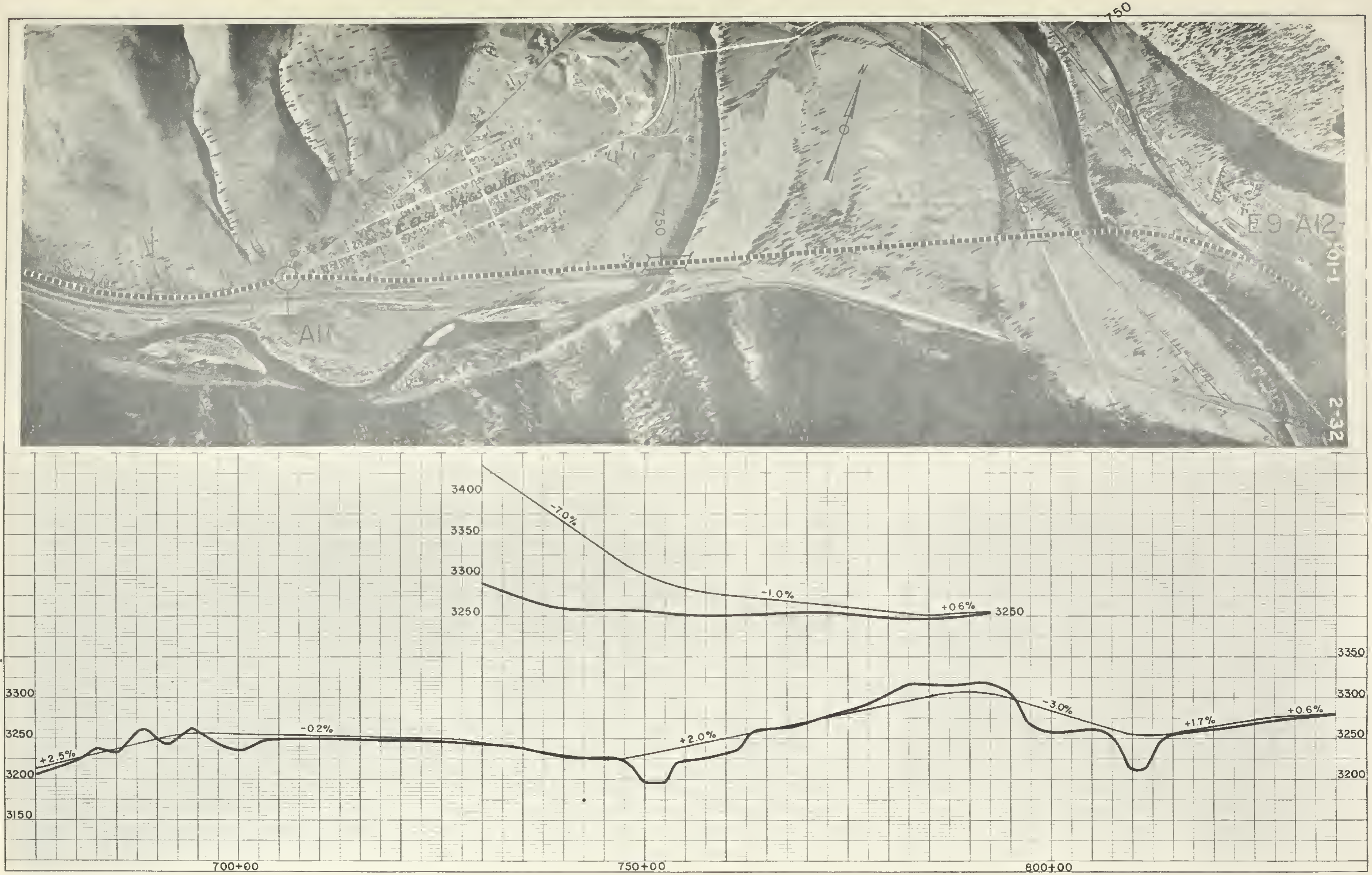
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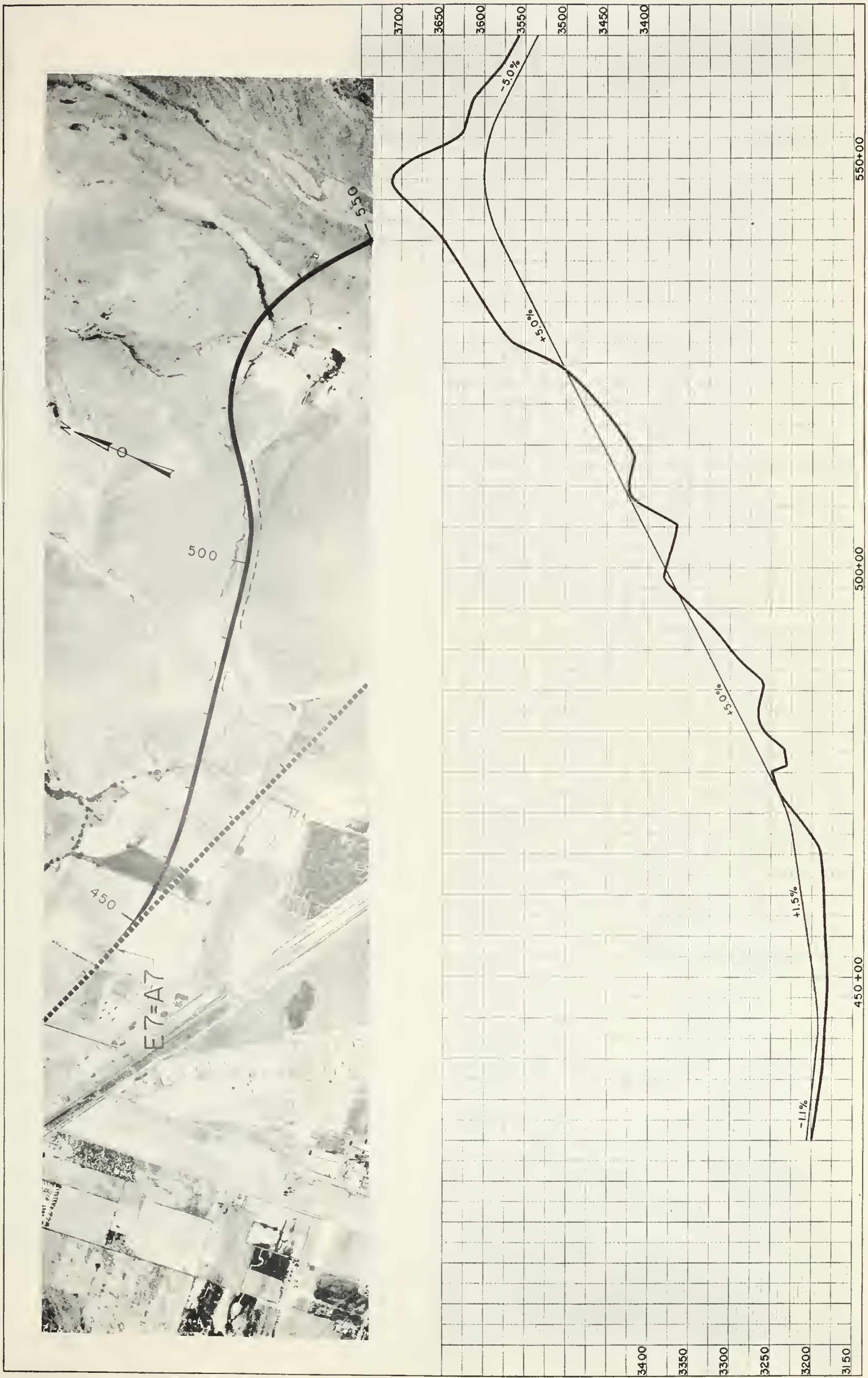
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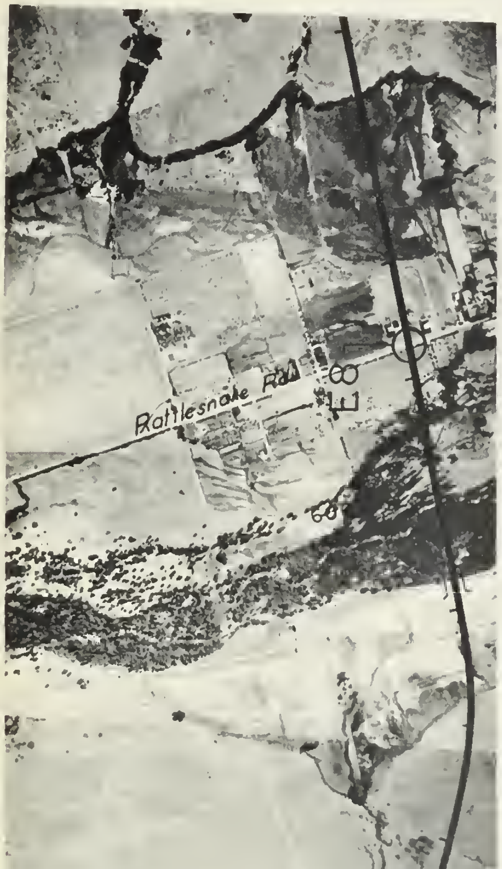
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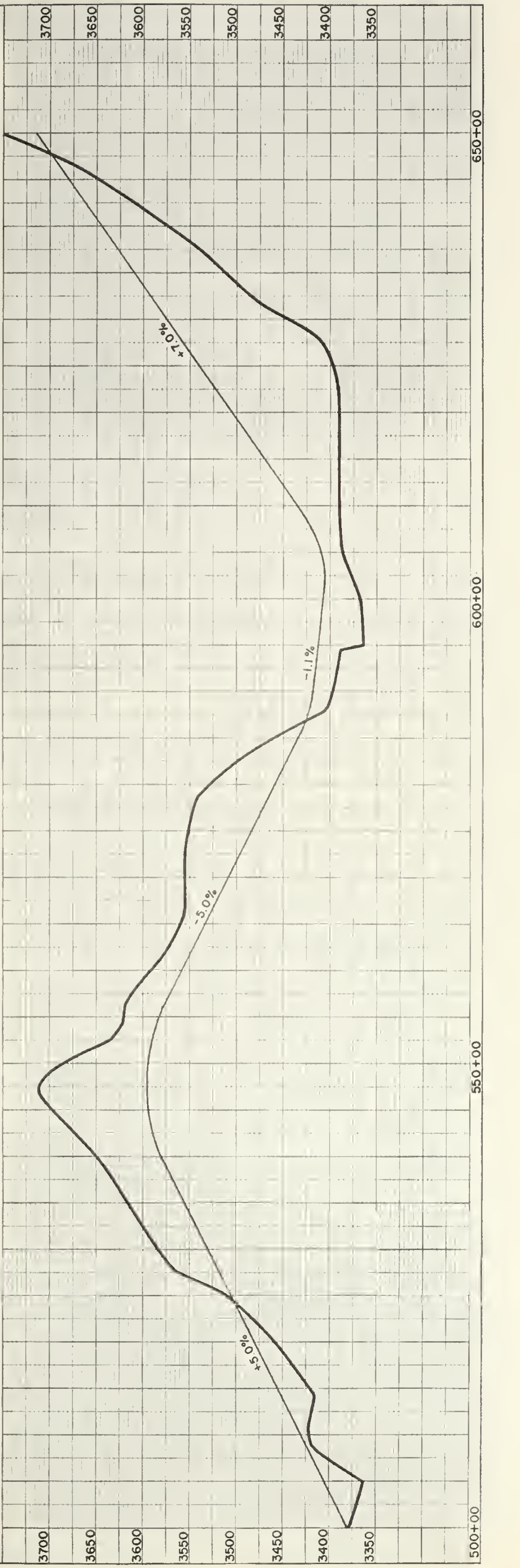
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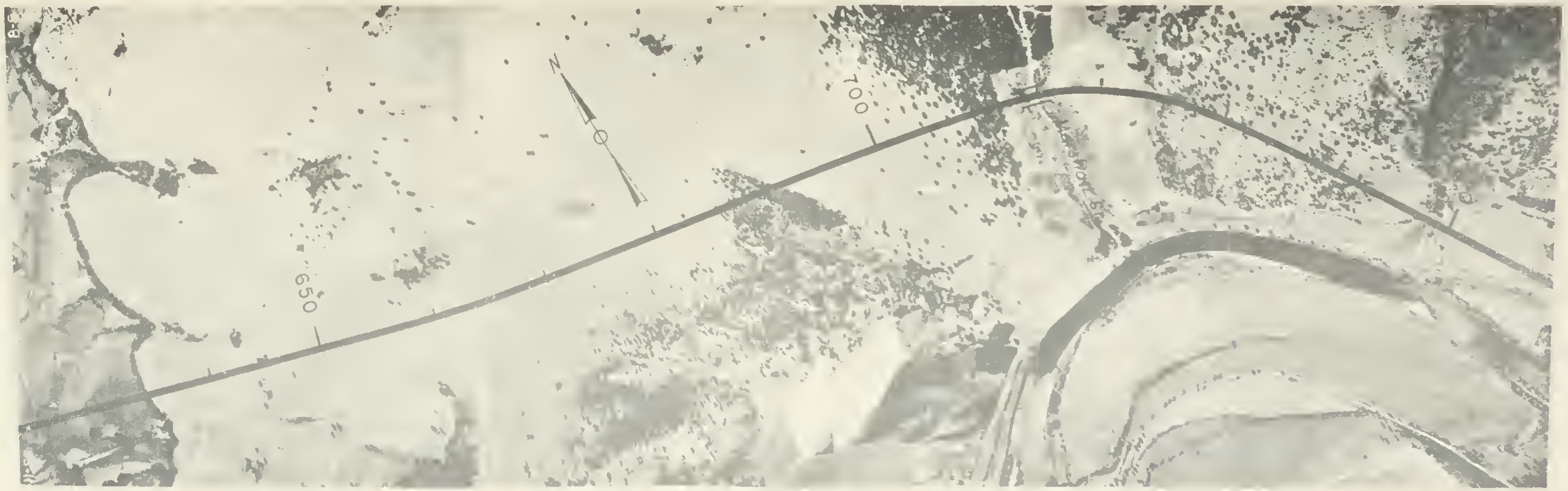
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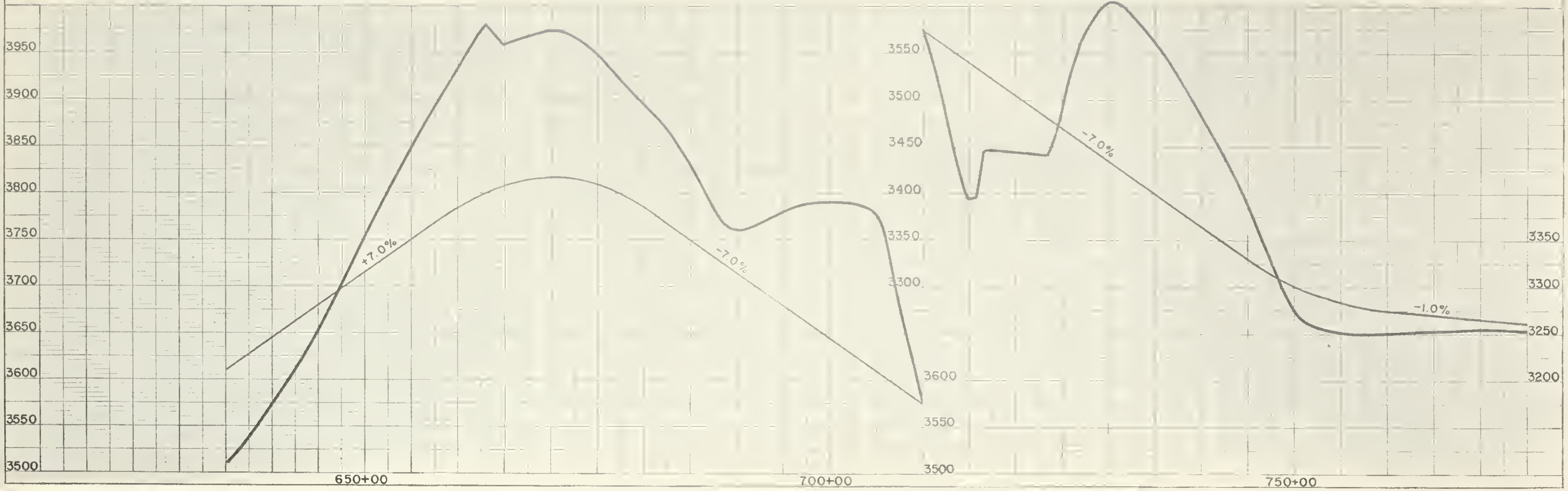
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PRELIMINARY COST ESTIMATE

SHEET 1 OF 7

PROJECT MISSOULA E & W

LOCATION

Section	"A"Line		"B"Line		"C"Line		"D"Line		"E"Line		"D1"Line	
Length, miles	15.9		16.1		16.2		16.1		15.2		16.1	
1975 DHV												
Number of lanes	4		4		4		4		4		4	
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	423		425		406		424		618		385	
2. Right-of-Way	2,708		2,676		2,077		2,541		886		2,541	
3. Clear & grub; demolition							[illegible]				3	
4. Utility adjustments	306		11		[illegible]		[illegible]		251		288	
5. Grade & drain; minor structures	1,652		1,644		[illegible]		1,556		7,326		1,541	
6. Base; surfacing; shoulders	3,226		3,266		[illegible]		3,259		[illegible]		[illegible]	
7. R. R. grade separations	535		535		465		535		535		135	
8. Highway grade separations without ramps	695		695		480		[illegible]		779		553	
9. Interchanges, complete	1,126		1,126		1,178		1,126		[illegible]		934	
10. Other bridges; tunnels	924		924		924		924				924	
11. Walls												
12. Guardrail; fencing; lighting; traffic control devices	297		289		296		340		254		340	
13. Roadside improvement												
14. All other items	40		40		40		40		40		40	
15. Subtotal, lines 3 to 14	8,801		8,830		[illegible]		8,812		12,369		8,007	
16. Construction Engineering & Contingencies, 10% of line 15	880		882		[illegible]		[illegible]		1,237		801	
17. Total Estimated Cost	12,812		12,813		12,711		[illegible]		[illegible]		11,734	

PRELIMINARY COST ESTIMATE

SHEET 2 OF 7

PROJECT MISSOULA E & W

LOCATION "A" LINE

Section	A1-A2	A2-A3	A3-A4	A4-A5	A5-A6	A6-A7	A7-A8	A8-A9	A9-A10	A10-A11	A11-A12	TOTAL
Length, miles	2.4	0.4	0.7	4.1	0.4	0.5	1.6	0.6	0.9	1.6	2.7	15.9
1975 DHV	680	1,255	1,255	1,255	1,255	1,045	1,045	1,045	880	1,645	1,460	
Number of lanes	4	4	4	4	4	4	4	4	4	4	4	4
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	46	17	22	60	50	8	27	19	43	36	95	423
2. Right-of-Way	63	11	6	153	58	73	78	1,000	859	200	207	2,708
3. Clear & grub; demolition												
4. Utility adjustments	14	4	7	20	5	6	0	11	107	91	41	306
5. Grade & drain; minor structures	188	220	163	285	113	50	143	66	137	113	174	1,652
6. Base; surfacing; shoulders	480	80	140	820	80	100	327	120	216	320	543	3,226
7. R. R. grade separations	--	--	135	--	400							535
8. Highway grade separations without ramps	41	41	--	82	254		70		97		110	695
9. Interchanges, complete	160	--	--		192			192	199	185	198	1,126
10. Other bridges; tunnels	--	--	--						84		840	924
11. Walls	--	--	--									
12. Guardrail; fencing; lighting; traffic control devices	33	6	13	44	6	4	24	15	46	40	66	297
13. Roadside improvement												
14. All other items	40	--	--									40
15. Subtotal, lines 3 to 14	956	351	458	1,251	1,050	160	564	404	886	749	1,972	8,801
16. Construction Engineering & Contingencies, 10% of line 15	96	35	46	125	105	16	56	40	89	75	197	880
17. Total Estimated Cost	1,161	414	532	1,589	1,263	257	725	1,463	1,877	1,060	2,471	12,812

PRELIMINARY COST ESTIMATE

SHEET 3 OF 7

PROJECT MISSOULA E & W

LOCATION "B" LINE

Section	B1-B2	B2-B3	B3-B4	A5-A12	TOTAL							
Length, miles	2.1	0.5	0.4	13.1	16.1							
1975 DHV	680	680	1,255	*								
Number of lanes	4	4	4	4	4							
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	34	14	17	360	425							
2. Right-of-Way	30	6	6	2,634	2,676							
3. Clear & grub; demolition												
4. Utility adjustments	18	1	4	288	311							
5. Grade & drain; minor structures	163	23	214	1,244	1,644							
6. Base; surfacing; shoulders	420	100	80	2,666	3,266							
7. R. R. grade separations				535	535							
8. Highway grade separations without ramps	41		41	613	695							
9. Interchanges, complete		160		966	1,126							
10. Other bridges; tunnels				924	924							
11. Walls												
12. Guardrail; fencing; lighting; traffic control devices	21	4	6	258	289							
13. Roadside improvement												
14. All other items	40				40							
15. Subtotal, lines 3 to 14	703	288	345	7,494	8,830							
16. Construction Engineering & Contingencies, 10% of line 15	70	29	34	749	882							
17. Total Estimated Cost	837	337	402	11,237	12,813							

*See Sheet #2

PRELIMINARY COST ESTIMATE

SHEET 4 OF 7

PROJECT MISSOULA E & W

LOCATION "C" LINE

Section	B1-B2	C2-C3	C3-C4	C4-C5	A5-A12	TOTAL						
Length, miles	2.1	0.6	4.4	0.8	8.3	16.2						
1975 DHV	680	680	1,255	1,255	*							
Number of lanes	4	4	4	4	4	4						
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	34	15	85	32	240	406						
2. Right-of-Way	30	49	358	65	2,475	2,977						
3. Clear & grub; demolition												
4. Utility adjustments	18	1	21	16	261	317						
5. Grade & drain; minor structures	163	28	296	149	796	1,432						
6. Base; surfacing; shoulders	420	120	940	162	1,706	3,348						
7. R. R. grade separations			150	315	--	465						
8. Highway grade separations without ramps	41		92		347	480						
9. Interchanges, complete		164	240		774	1,178						
10. Other bridges; tunnels					924	924						
11. Walls												
12. Guardrail; fencing; lighting; traffic control devices	21	4	38	32	201	296						
13. Roadside improvement												
14. All other items	40					40						
15. Subtotal, lines 3 to 14	703	317	1,777	674	5,009	8,480						
16. Construction Engineering & Contingencies, 10% of line 15	70	32	178	67	501	848						
17. Total Estimated Cost	837	413	2,398	838	8,225	12,711						

* See Sheet #2

(No interchange or connection at Reserve Street)

PRELIMINARY COST ESTIMATE

SHEET 5 OF 7

PROJECT MISSOULA E & W

LOCATION "D" LINE (With Reserve Street Connection)

Section	A1-A4	D4-D5	A8-A12	TOTAL								
Length, miles	3.5	6.8	5.8	16.1								
1975 DHV	790	1,005	1,355									
Number of lanes	4	4	4	4								
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	85	146	193	424								
2. Right-of-Way	80	195	2,266	2,541								
3. Clear & grub; demolition	--	3	--	3								
4. Utility adjustments	25	13	250	288								
5. Grade & drain; minor structures	571	495	490	1,556								
6. Base; surfacing; shoulders	700	1,360	1,199	3,259								
7. R. R. grade separations	135	400	--	535								
8. Highway grade separations without ramps	82	452	207	741								
9. Interchanges, complete	160	192	774	1,126								
10. Other bridges; tunnels	--		924	924								
11. Walls	--											
12. Guardrail; fencing; lighting; traffic control devices	52	121	167	340								
13. Roadside improvement												
14. All other items	40			40								
15. Subtotal, lines 3 to 14	1,765	3,036	4,011	8,812								
16. Construction Engineering & Contingencies, 10% of line 15	177	304	401	882								
17. Total Estimated Cost	2,107	3,681	6,871	12,659								

PRELIMINARY COST ESTIMATE SHEET 6 OF 7

PROJECT MISSOULA E & W LOCATION "E" LINE

Section	A1-A7	E7-E8	E8-E9	TOTAL								
Length, miles	8.5	3.2	3.5	15.2								
1975 DHV	1,035	390	350									
Number of lanes	4	4	4	4								
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	203	171	244	618								
2. Right-of-Way	364	249	273	886								
3. Clear & grub; demolition												
4. Utility adjustments	56	51	44	151								
5. Grade & drain; minor structures	1,019	2,493	3,814	7,326								
6. Base; surfacing; shoulders	1,700	642	700	3,042								
7. R. R. grade separations	535			535								
8. Highway grade separations without ramps	418	111	250	779								
9. Interchanges, complete	352	192	198	742								
10. Other bridges; tunnels												
11. Walls												
12. Guardrail; fencing; lighting; traffic control devices	106	72	76	254								
13. Roadside improvement												
14. All other items	40			40								
15. Subtotal, lines 3 to 14	4,226	3,561	5,082	12,869								
16. Construction Engineering & Contingencies, 10% of line 15	423	356	508	1,287								
17. Total Estimated Cost	5,216	4,337	6,107	15,660								

PRELIMINARY COST ESTIMATE

SHEET 7 OF 7

PROJECT MISSOULA E & W

LOCATION "D₁" LINE (Without Reserve Street Connection)

Section	A1-A4	D4-D5	A8-A12	TOTAL								
Length, miles	3.5	6.8	5.8	16.1								
1975 DHV	735	860	1,355									
Number of lanes	4	4	4	4								
WORK CLASSIFICATION	ESTIMATED COSTS (1,000 Dollars)											
1. Preliminary engineering	85	107	193	385								
2. Right-of-Way	80	195	2,266	2,541								
3. Clear & grub; demolition		3		3								
4. Utility adjustments	25	13	250	288								
5. Grade & drain; minor structures	571	480	490	1,541								
6. Base; surfacing; shoulders	700	1,350	1,199	3,249								
7. R. R. grade separations	135			135								
8. Highway grade separations without ramps	82	264	207	553								
9. Interchanges, complete	160		774	934								
10. Other bridges; tunnels			924	924								
11. Walls												
12. Guardrail; fencing; lighting; traffic control devices	52	121	167	340								
13. Roadside improvement												
14. All other items	40			40								
15. Subtotal, lines 3 to 14	1,765	2,231	4,011	8,007								
16. Construction Engineering & Contingencies, 10% of line 15	177	223	401	801								
17. Total Estimated Cost	2,107	2,756	6,871	11,734								